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(54) **SIDE WALL SUPPORT PIER AND METHOD FOR FOUNDATION OF MANUFACTURED BUILDING**

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See application file for complete search history.

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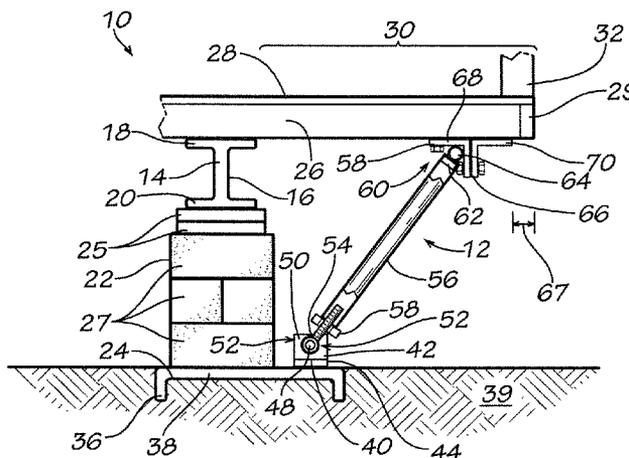
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(57) **ABSTRACT**

An apparatus for supporting a lateral portion of a manufactured building having a support beam, comprising a ground member for being received on a ground surface and a joist bracket attached to at least one joist in a lateral portion of the manufactured building. A pivotably attached joist tube disposed in a first position between the ground member and the joist bracket is longitudinally movable to a second position for bearing forcibly therebetween and thereby supporting the lateral portion of the manufactured building. A method of supporting a lateral portion of a manufactured building having a support beam is disclosed.

**31 Claims, 10 Drawing Sheets**



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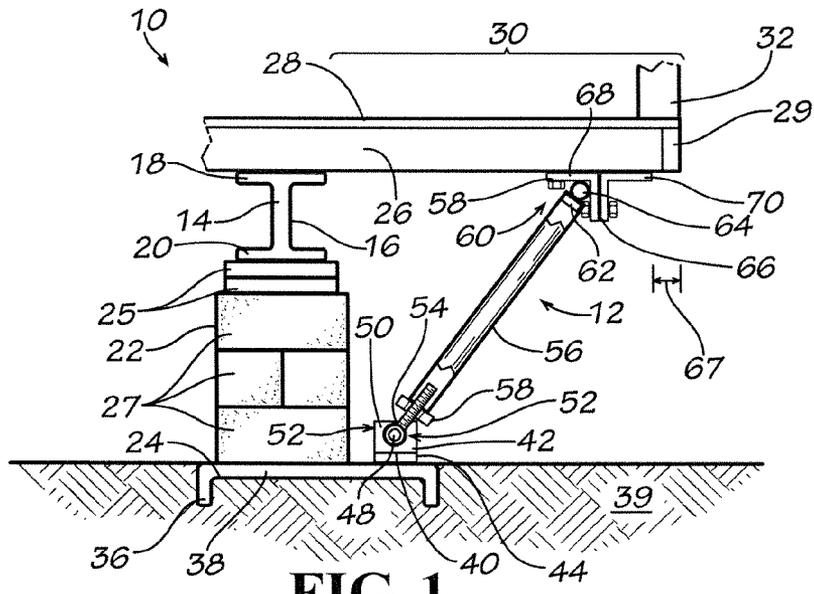


FIG. 1

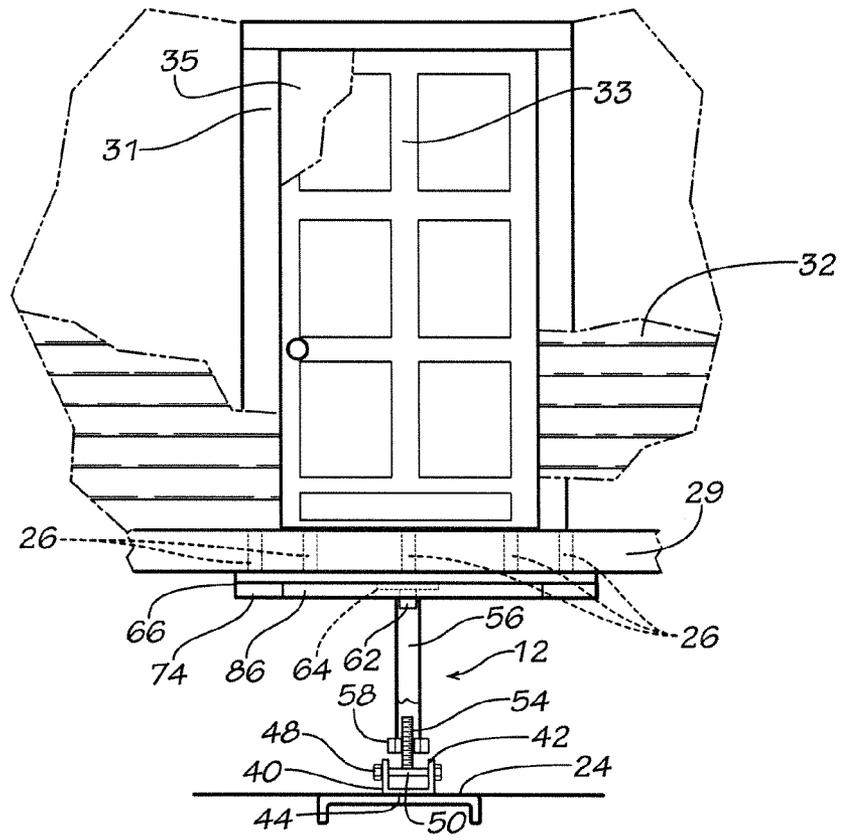


FIG. 2

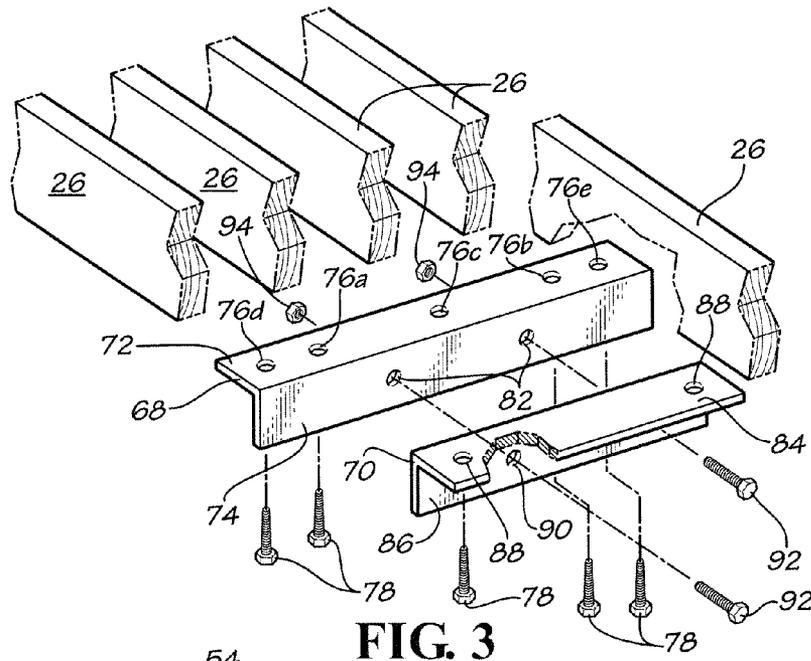


FIG. 3

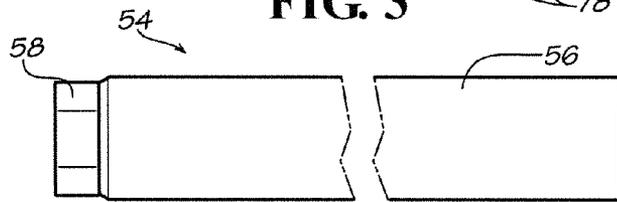


FIG. 4

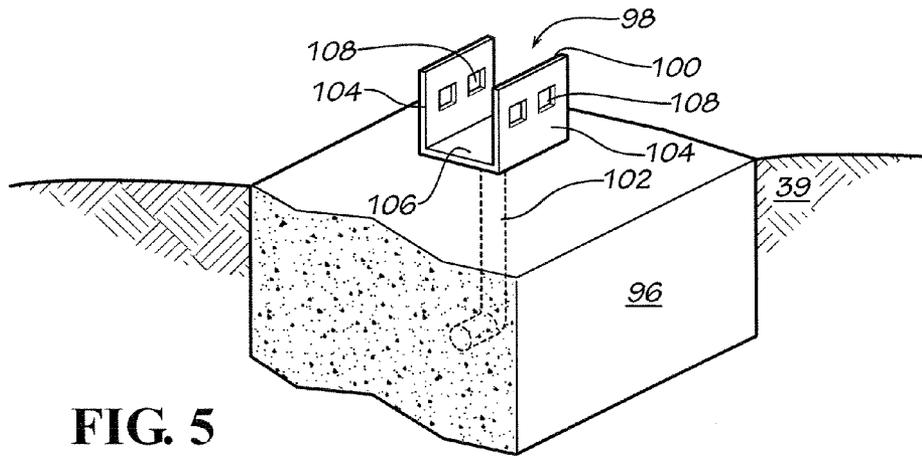


FIG. 5

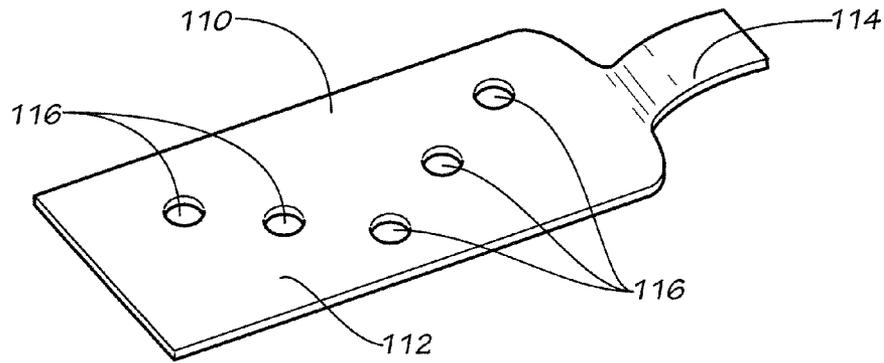


FIG. 6

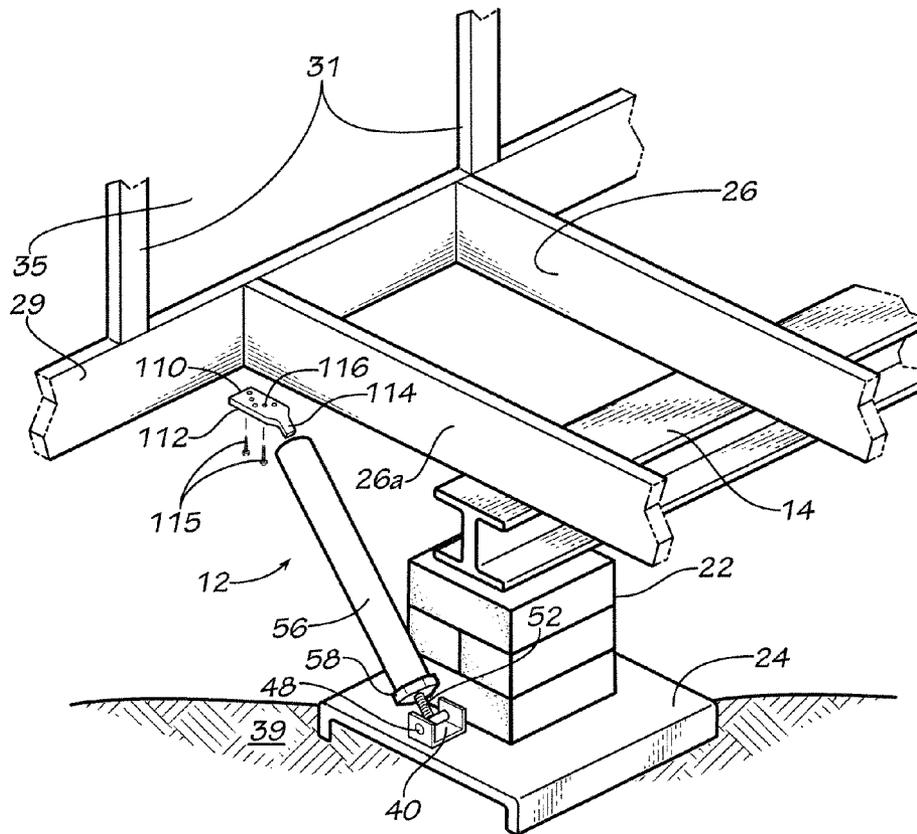


FIG. 7

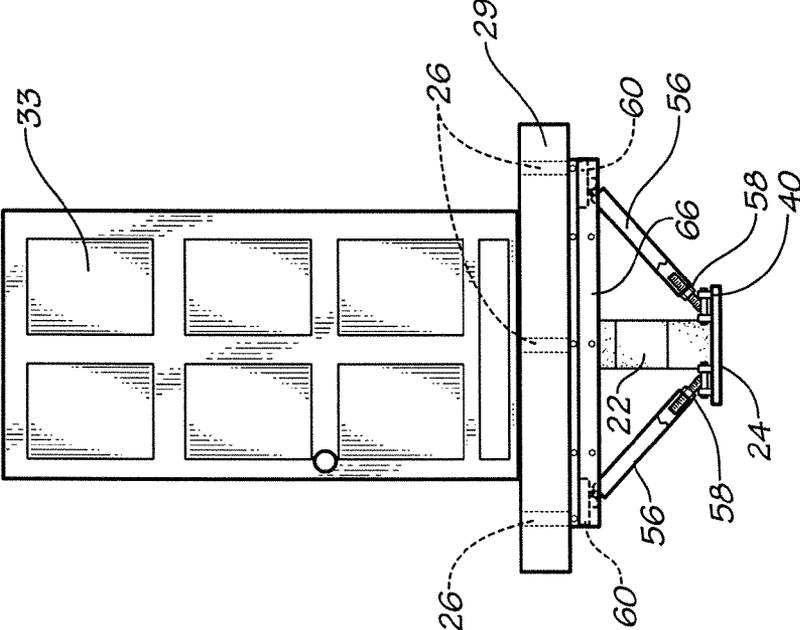


FIG. 9

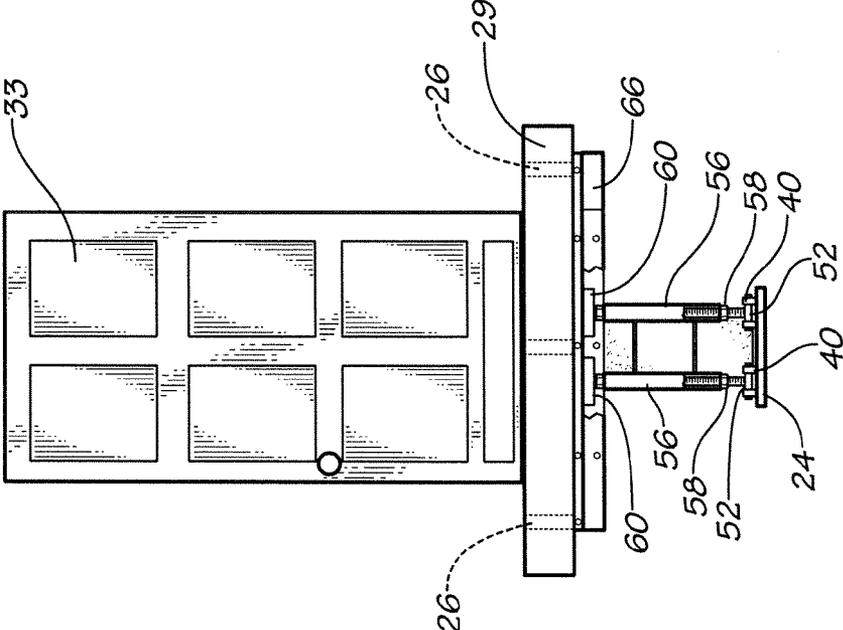


FIG. 8

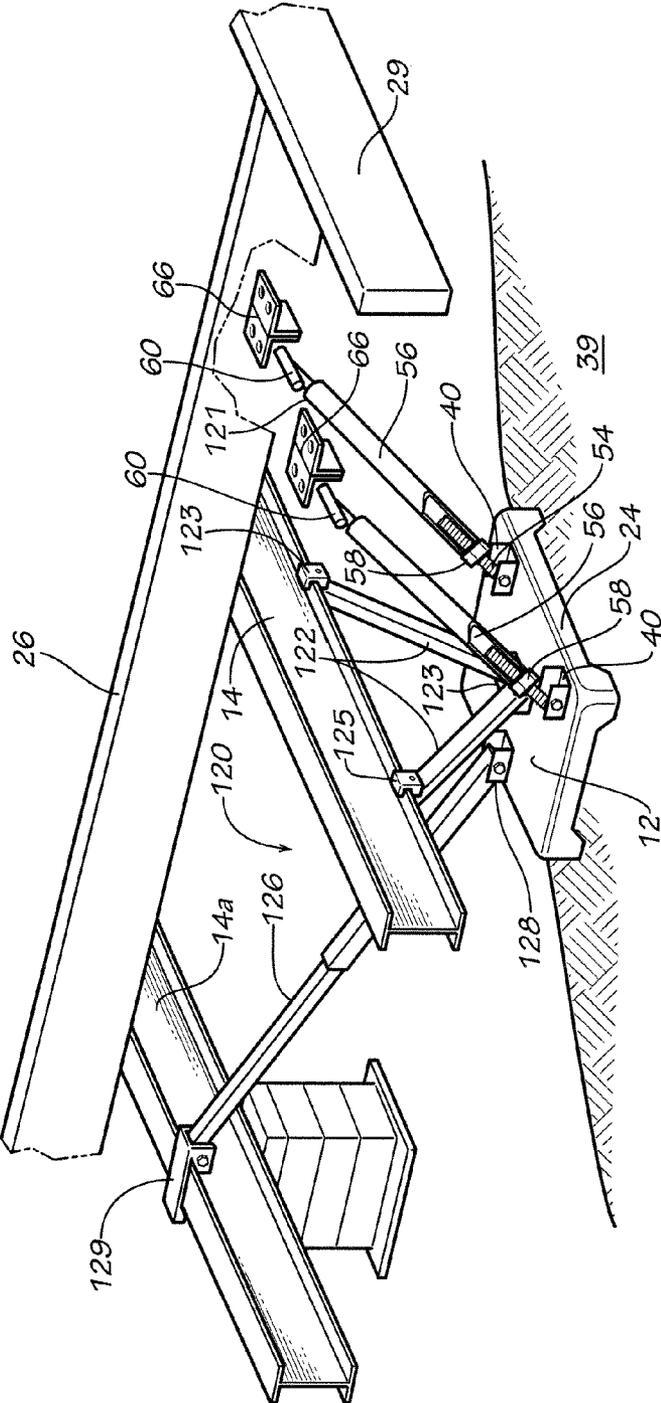


FIG. 10

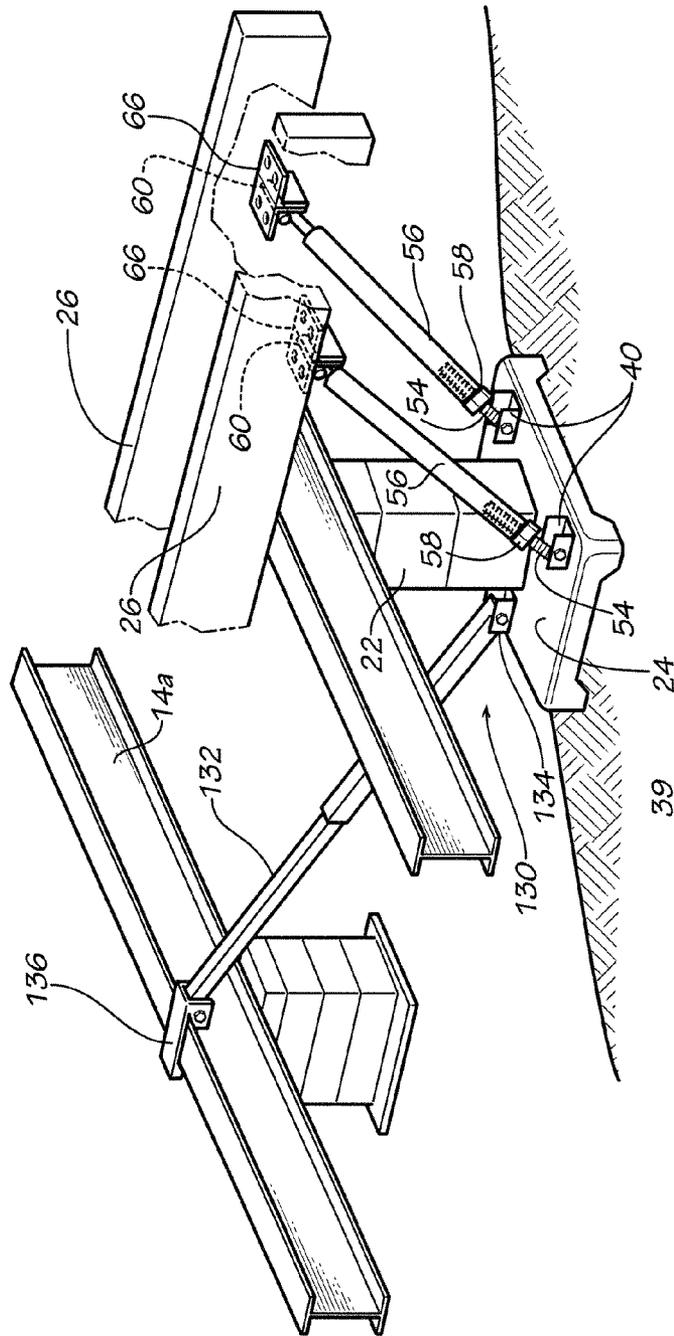


FIG. 11



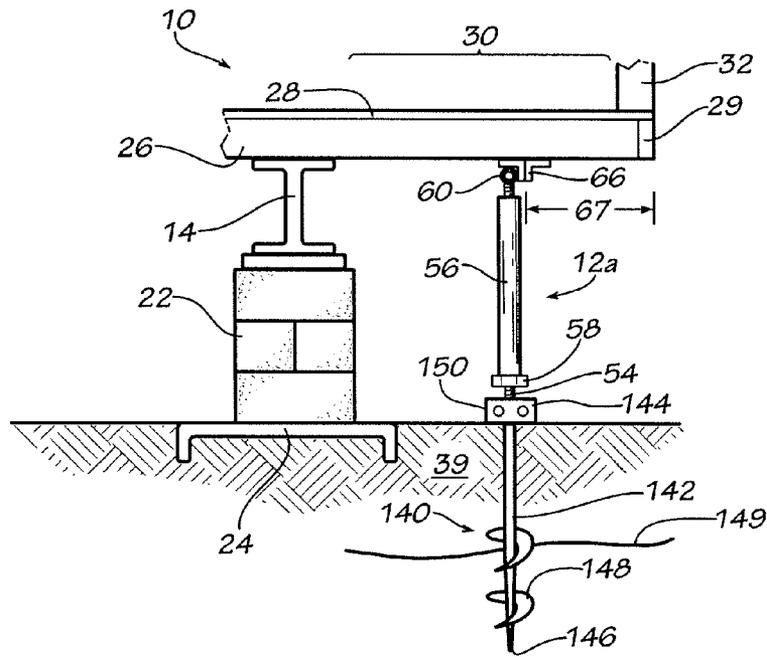


FIG. 13a

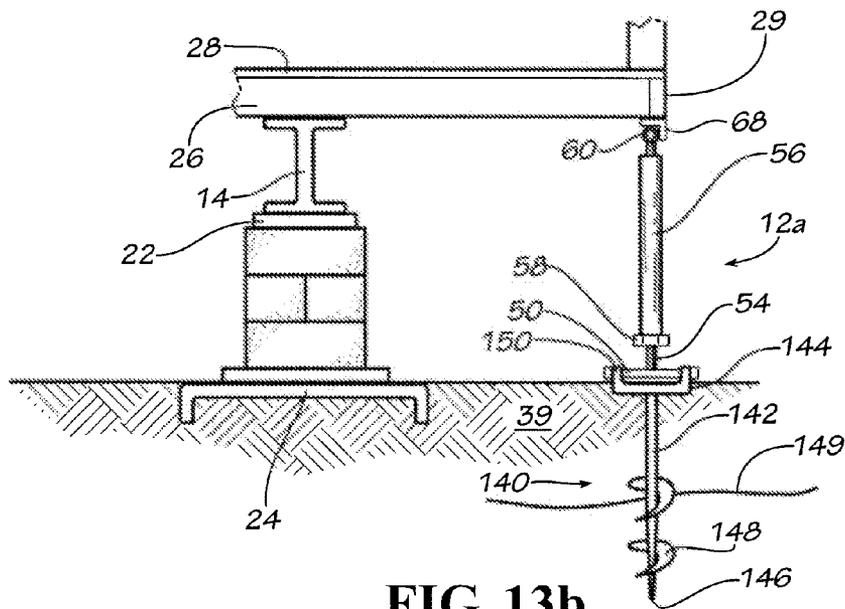


FIG. 13b

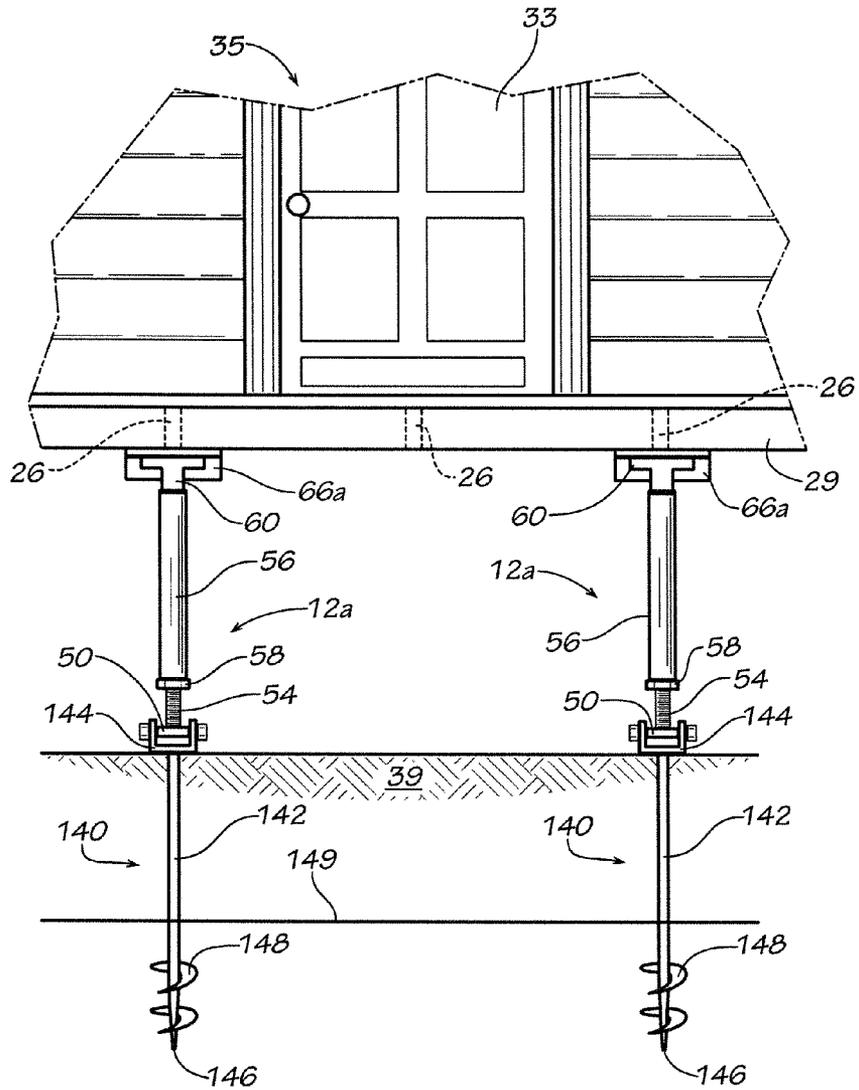


FIG. 14

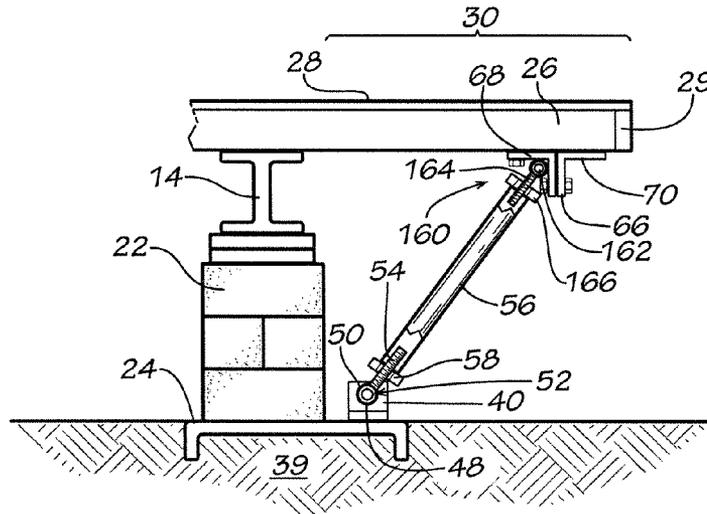


FIG. 15

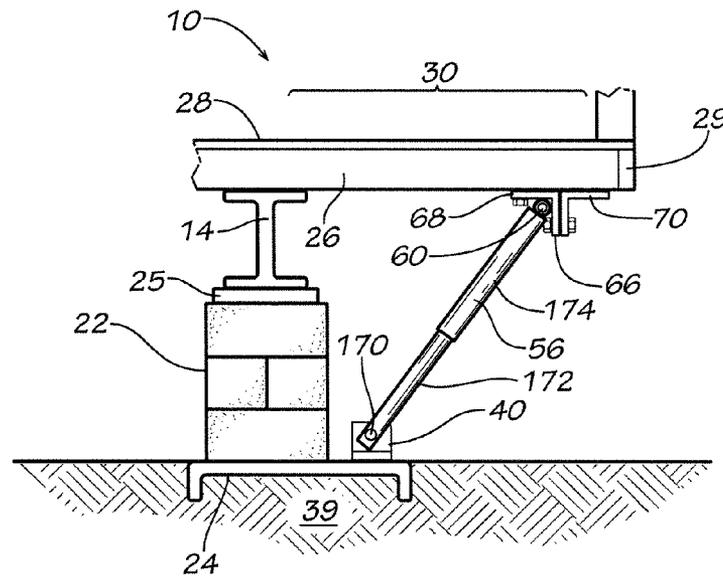


FIG. 16

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## SIDE WALL SUPPORT PIER AND METHOD FOR FOUNDATION OF MANUFACTURED BUILDING

### TECHNICAL FIELD

The present invention relates to foundations for manufactured buildings. More particularly, the present invention relates to apparatus and methods for a foundational support of a lateral portion of a manufactured building.

### BACKGROUND OF THE INVENTION

Manufactured buildings, such as manufactured or mobile homes and offices, are manufactured remote from an installation site and moved on wheels to the installation site. The manufactured building typically includes one or more long, longitudinal support I-beams underneath the building. A plurality of spaced-apart floor joists extend transverse to a longitudinal axis of the support beam. Adjacent floor joists define gaps. The gaps on opposing sides of the manufactured building are closed by perimeter rim joists that attach to the ends of the floor joists. A subfloor attaches to the floor joists. The side walls of the manufactured building define openings for door ways and windows or for other load-imposing features such as chimneys or fireplaces.

During typical installation of a manufactured building at a site, a plurality of piers placed between a ground surface and the support beam support the building on the site. The piers sit on or attach to footings such as metal plates or pans, plastic plates, or concrete pads placed or poured on-site during installation. The number, and positioning, of piers is specified by the manufacturer of the manufactured building or by an authority having jurisdiction for such specifications.

Different types of piers are known. One type of pier uses stacks of cement blocks that sit on footings and transfer load from the support beam. Other piers use metal tubular members that connect between a ground pan and the support beam. Additionally, some foundation systems for manufactured buildings also resist lateral and longitudinal wind and/or seismic forces on the building. These foundation systems typically use a ground pan and an elongated strut connected at a lower end to the ground pan and at the upper end to a support beam of the manufactured building. The elongated strut can be oriented parallel to a longitudinal axis of the support beam or extend laterally from underneath one support beam to connect to the adjacent support beam of the manufactured buildings, or both. Such foundations provide resistance to wind and/or seismic forces in the lateral and longitudinal directions.

Often the support beam is positioned inwardly of a lateral perimeter portion of the manufactured building. The plurality of floor joists extends outwardly as cantilevers laterally of the I-beam. This structure disposes a portion of the manufactured building lateral of the support beams. Piers are necessary for supporting perimeter portions of the manufactured buildings. Openings in the side walls for windows and doorways require a support pier proximate the opening. Generally, an opening of 48 inches or more in a side wall of a manufactured building requires pier supports. For example, door openings require two support piers on the opposing sides of the opening at the perimeter of the building. Chimneys and fireplaces or other load-bearing objects (such as water beds) may require additional pier support on the perimeter of the building. Roof loads (for example, snow loading) may require use of additional piers on the perimeter. Pier installation requires time and labor.

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Accordingly, there is a need for an improved pier to support portions of a manufactured building lateral of the support beam and proximate an opening in a side wall of a manufactured building. It is to such that the present invention is directed.

### BRIEF SUMMARY OF THE INVENTION

The present invention meets the need in the art by providing a support apparatus for supporting a lateral portion of a manufactured building having a support beam, comprising a ground member for being received on a ground surface beneath a manufactured building having a portion thereof lateral of a support beam and a joist bracket attached to at least one joist within the lateral portion of the manufactured building. A joist tube is disposed between the ground pan and the joist bracket. The joist tube bears against the joist bracket and the ground member for transferring a load from the lateral portion of the manufactured building to the ground and thereby supporting the lateral portion of the manufactured building.

In another aspect, the present invention provides a method for supporting a lateral portion of a manufactured building having a support beam, comprising the steps of:

(a) positioning a ground member on a ground surface below a lateral portion of a manufactured building;

(b) attaching a joist bracket to at least one joist within the lateral portion of the manufactured building; and

(c) disposing a joist tube in bearing contact between the ground member and the joist bracket,

whereby the joist tube bears forcibly against the joist bracket to support the lateral portion of the manufactured building.

Objects, advantages, and features of the present invention will be apparent upon a reading of the detailed description together with observing the drawings and reading the appended claims.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates in side elevational view a manufactured building with an embodiment of a support pier according to the present invention supporting a lateral portion of the manufactured building proximate an opening in a side wall.

FIG. 2 illustrates in detailed front elevational view the support pier illustrated in FIG. 1 supporting a lateral portion of the manufactured building proximate an opening for a door in a side wall.

FIG. 3 illustrates in exploded perspective view a joist bracket of the support pier, which attaches to the spaced-apart floor joists inwardly of a perimeter rim joist.

FIG. 4 illustrates in side view a joist tube used with the support pier illustrated in FIG. 1.

FIG. 5 illustrates in perspective view an alternate embodiment of a ground support for the support pier of the present invention.

FIG. 6 illustrates in perspective view an alternate embodiment of a joist bracket for use with embodiments of the support pier.

FIG. 7 illustrates in perspective exploded view the support pier and the joist bracket shown in FIG. 6 installed for supporting a portion of a manufactured building where an opening in a side wall is transverse to the floor joists of the manufactured building.

FIG. 8 illustrates in side elevational view a pair of the support piers for supporting a lateral portion of a manufactured building.

FIG. 9 illustrates in side elevational view a pair of the support piers for supporting a lateral portion of a manufactured building.

FIG. 10 illustrates in perspective view a pair of the support piers used together with a foundation system that provides lateral and longitudinal wind load resistance for the manufactured building.

FIG. 11 illustrates in perspective view a pair of the support piers used together with a foundation system that provides lateral wind load resistance for the manufactured building.

FIG. 12 illustrates in elevational view an alternate embodiment of the support pier according to the present invention using a ground anchor for supporting a lateral portion of the manufactured building.

FIG. 13a illustrates in side elevational view a first alternate position of the support pier shown in FIG. 12 for supporting a lateral portion of the manufactured building.

FIG. 13b illustrates in side elevational view a second alternate position of the support pier shown in FIG. 12 for supporting a lateral portion of the manufactured building.

FIG. 14 illustrates in elevational view an alternate application using pair of the support piers with ground anchors for supporting the lateral portion of the manufactured building.

FIG. 15 illustrates in side elevational view an alternate embodiment of the support pier for supporting the lateral portion of the manufactured building.

FIG. 16 illustrates in side elevational view an alternate embodiment of the support pier for supporting the lateral portion of the manufactured building.

#### DETAILED DESCRIPTION

With reference to the drawings, in which like elements have like identifiers, FIG. 1 illustrates a side elevational view of a portion of a manufactured building 10 having an embodiment of a support pier 12 supporting a portion of the manufactured building lateral of a long, longitudinal support beam 14. The support beam 14 conventionally is an I-beam having a central web 16 with spaced-apart upper and lower forward and rearward laterally extending opposing flanges 18, 20. The support beam 14 sits on a cement block pier 22 positioned on a ground foundation member or support that in the illustrated embodiment is a metal ground pan 24. Wooden spacer boards 25 are depicted between the support beam 14 and an upper surface of the stack of cement blocks 27 in the pier 22. Typically, the support beam 14 is spaced inwardly of the side wall (for example, typically 2-3 feet or more). This disposes the ground pan 24 away from the side wall and side skirting where water may collect and saturate the ground. Saturated ground may cause ground heave or movement that occurs due to freezing and thawing.

The support beam 12 underneath the manufactured building supports the plurality of spaced-apart floor joists 26 disposed transverse to a longitudinal axis of the support beam 12. A perimeter rim joist 29 attaches outwardly of the ends of the floor joists 26. The joists 26 support a floor 28 of the manufactured building 10. A portion 30 of the manufactured building extends laterally of the support beam 14.

As best illustrated in FIG. 2, portions of a side wall 32 of the manufactured building 10 define openings for windows (not illustrated) and for doors 33. Edges generally 31 of the side wall structure define the opening generally 35. An embodiment of the support pier 12 supports the lateral portion 30 of the manufactured building proximate the opening. With continuing reference to FIGS. 1 and 2, the support pier 12 includes the metal ground pan 24. The ground pan 24 has a planar base and at least a pair of opposing sides 38 or insertion

perimeter members that extend from respective perimeter edges in a first direction substantially perpendicular to the base for being embedded in the ground. In the illustrated embodiment, the ground pan 24 includes a leg 36 at each of the corners of the ground pan extending from adjacent insertion perimeters 38. The insertion perimeters 38 define side walls that extend from perimeter edges into the ground 39 below the manufactured building at a site. The legs 36 extend downwardly from a top surface of the ground pan to a distal extent a first distance that is greater than a second distance of a distal extent of the insertion perimeter 38. The ground pan 24 is made of strong material such as of steel. It is to be appreciated that as an alternative, ground pans or plates having stakes or spikes that extend into the ground may be gainfully used.

A U-shaped connector 40 has a base 44 and two opposing side walls 42 or upstanding legs extending from the base 44. The connector 40 attaches to the ground pan 24. The U-shaped connector 40 in the illustrated embodiment is made from a  $\frac{3}{16}$  inch G-60 galvanized stamped coil stock material. The base 44 defines at least one opening for a fastener to extend though an aligned opening in the ground pan 24 to rigidly attach the connector to the ground pan. The side walls 42 define aligned openings for receiving a bolt 48 that is secured with a nut (not illustrated). The bolt 48 extends through the aligned openings in the side walls 42 and through an open-ended tube 50 of a T-bolt 52. The T-bolt 52 includes the tube 50 and a threaded member 54. The threaded member 54 welds to the tube 50. In the illustrated embodiment, the tube 50 is a 12 gauge 1 inch $\times$ 1 and  $\frac{5}{8}$  inch steel tube. The threaded member 54 is a  $\frac{3}{4}$  inch $\times$ 6 inch metal rod.

A joist tube 56 connects to the threaded member 54. As best illustrated in FIG. 4, the joist tube 56 is an elongated open-ended tube. The joist tube 56 in the illustrated embodiment is a 12 gauge,  $\frac{1}{4}$  inch diameter by 60 inch long steel tube. In the illustrated embodiment, a threaded nut 58 is positioned at a first end of the joist tube 56. The threaded nut 58 threadably connects to the member 54, as discussed below. In the illustrated embodiment, the nut 58 welds to the end of the joist tube 56.

With continuing reference to FIG. 1, a distal end of the joist tube 56 receives a T-cap 60. The T-cap 60 has base member 62 sized to be received on or in the distal end of the joist tube 56. In the illustrated embodiment, the base member 62 is a tube sized for being received within the joist tube 56. A bearing member 64 welds to the base member 62. The bearing member 64 is transverse to the base member 62. In the illustrated embodiment the bearing member 64 is a 0.6875 inch diameter solid steel rod of A36M steel.

A joist bracket 66 attaches to at least one of the joists to communicate loading from the manufactured building through the joist tube 56 to the ground. In the embodiment illustrated in FIG. 1, the opening 35 is defined in a side wall perpendicular to the longitudinal axis of the floor joists 26. A first embodiment of the joist bracket 66 is disposed transverse to the floor joists 26 and spaced-inwardly a predetermined distance 67 from an outer face of the rim joist 29. The set-back 67 provides space outward therefrom for installing side skirts (not illustrated) in alignment with the side wall of the manufactured building. The side skirts cover openings or gaps between the bottom of the building and the ground. The joist bracket 66 spans a plurality of the floor joists 26 to distribute the loading of the manufactured building. The joist bracket 66 attaches to a plurality of the spaced-apart floor joists 26. The joist bracket 66 in the first embodiment comprises a first angle member 68 and a second angle member 70. As best illustrated in FIG. 3, the first angle member 68 includes a leg 72 that

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contacts the joists **26** and a depending back **74**. The leg **72** defines a plurality of openings **76a-e** for receiving fasteners **78** in selected ones of the openings to secure the joist bracket **66** to the joists **26**. In the illustrated embodiment, the fasteners are threaded lag screws but other fasteners may be used.

In the illustrated embodiment, the first angle member **68** is 48 inches long. Two openings **76a** and **76b** are spaced 15<sup>3</sup>/<sub>4</sub> inches from a central opening **76c** for joists on 16 inch centers. Two openings **76d** and **76e** are spaced 7<sup>1</sup>/<sub>2</sub> inches from the respective adjacent opening **76a**, **76b** to accommodate joists on 24 inch centers. The depending back **74** defines a pair of openings **82** spaced 16 inches apart and 16 inches from the respective end of the angle member **68**.

The second angle member **70** includes a leg **84** that contacts the joists and a depending back **86**. The angle member **70** is 38 inches long and the leg **84** defines two openings **88**. In the illustrated embodiment, these openings are spaced 3 inches from the respective distal end and 32 inches apart. Fasteners **78** may be used to secure the second angle member **70** to the joists **26**. The depending back **86** defines a pair of openings **90** spaced 16 inches apart in alignment with the openings **82** in the first angle member **68**. Bolts **92** extend through the aligned openings **82**, **90** and receive nuts **94** to connect the first and second angle members **68**, **70** rigidly together.

FIG. 5 illustrates an alternate embodiment in which the support pier **12** uses a poured concrete pad **96** that receives an anchor head **98** having a U-shaped head **100** and a J-member **102**. The J-member **102** is embedded into the poured concrete that cures to rigidly secure the anchor head **98** to the concrete pad **96**. The U-shaped head **100** includes opposed side walls **104** and base **106**. The side walls **104** define aligned openings **108** for receiving the bolt **48** and T-bolt **52** for connecting to the joist tube **56**, as discussed below.

FIG. 6 illustrates in perspective view an alternate embodiment of a joist bracket **110** for use with embodiments of the support pier **12**. The joist bracket **110** is a plate having a base portion **112** and a neck portion **114**. The plate bends between the base portion **112** and the neck portion **114**. The bend positions the neck portion **114** at an approximate 15 degree angle relative to the base portion **112**. A plurality of holes **116** are defined in the base portion **112** for receiving fasteners to secure the joist bracket **110** to a joist **26** as discussed below.

FIG. 7 illustrates in perspective exploded view the support pier **12** using the joist bracket **110** shown in FIG. 6, in order to support a portion of a manufactured building **12** where an opening in a side wall is transverse to the floor joists **26** (or parallel to the longitudinal axis of the support beam **14**) of the manufactured building. The joist bracket **110** is shown exploded from the selected joist **26a** medial the opening **35** in the side wall (not illustrated). Fasteners **115** extend through the openings **116** and into the joist **26** to secure the joist bracket **110** to the joist. The joist bracket **110** is disposed with the neck portion **114** angling downwardly from the manufactured building. The joist bracket **110** installs with a set-back (approximately 10 inches) from an outside face of the rim joist **29**. The ground pan **24** seats below the support beam **14** and in-line with the joist **26a**. The connector **40** attaches to the ground pan **24**, and with the T-bolt **52**, connects to the joist tube **56**. The necked portion **114** seats in the open distal end of the joist tube **56**. The joist tube **56** is moved as discussed below to bear forcibly against the joist bracket **110**.

FIG. 8 illustrates in side elevational view a pair of the support piers **12** for supporting a lateral portion of a manufactured building **10**. In this illustrated application, each the joist tubes **56** attaches to a separate spaced-apart connector **40** and bears against an elongated joist connector **66**. The joist

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connector **66** spans a plurality of the joists **26** for distributing loading to the ground through the joist tubes **56** and the ground foundation member. An alternate embodiment (not illustrated) uses separate ones of the joist bracket **66** that are sufficiently long so that the T-cap **60** extending from the joist tubes **56** bears against a respective joist connector **66**. The joist brackets **66** distribute the loading on the side wall through the joist tubes **56** and ground pan to the ground.

FIG. 9 illustrates in side elevational view a pair of the support piers **12** for supporting a lateral portion of a manufactured building **10**. In this illustrated application, each the joist tubes **56** attaches to a separate spaced-apart connector **40** and bears through separate T-caps **60** against the joist bracket **66**. The connectors **40** are disposed at an angle so that the joist tubes **56** are oriented at an angle towards the edge of the side wall that defines the opening (for example, as illustrated, an opening closable by the illustrated door). The joist brackets **66** distribute the loading on the side wall proximate the opening through the joist tube **56** and ground pan to the ground.

FIG. 10 illustrates in perspective view a pair of the support piers **12** used together with a foundation system for a manufactured building. The illustrated foundation system generally **120** is exemplary and provides lateral and longitudinal wind load resistance for the manufactured building. The system **120** uses the ground pan **24**. A pair of longitudinal braces **122** pivotably connect at respective first ends through a connector **123** to the ground pan **24** and pivotably connect at an opposing second end through a beam connector **125** to the support beam **14**. A lateral brace **126** connects at a first end through a connector **128** to the ground pan **24** and connects at an opposing second end through a beam connector **129** to an adjacent support beam **14a**. The details and structure of the foundation system **120** useful with the support pier **12** of the present invention are disclosed in U.S. Pat. Nos. 6,634,150 and 7,526,899. U.S. Pat. No. 6,634,150 discloses a foundation with a lateral brace for a manufactured building. U.S. Pat. No. 7,526,899 discloses a foundation with longitudinal braces for a manufactured building. No further discussion of these exemplary foundations is believed necessary.

FIG. 11 illustrates in perspective view a pair of the support piers **12** used together with a foundation system **130**. The foundation system **130** uses the ground pan **24**. A lateral brace **132** connects at a first end through a connector **134** to the ground pan **24** and connects at a second end through a connector **136** to the adjacent support beam **14a**. The block pier **22** between the support beam **14** and the ground pan **24** transfers vertical loading of the manufactured building **10** to the ground.

FIG. 12 illustrates in elevational view an alternate embodiment of the support pier **12a**. The alternate embodiment uses a ground anchor **140** for the ground member that engages the ground to support the lateral portion of the manufactured building **10**. The ground anchor **140** includes a shaft **142** having a connector **144** at a first end and a distal tip **146** at an opposing end. One or more helical thread members **148** attach in spaced-apart relation to the shaft **142** proximate the distal tip **146**. The shaft **142** has a length sufficient to dispose the helical flights **148** below a frost line **149** of the ground **39**. The connector **144** is similar to the connector **40** discussed above. The connector **144** in the illustrated embodiment is a plate folded to define a U-shape with a base **151** and a pair of opposing upstanding side walls **150**. The side walls **150** each define at least one opening aligned with the opening in the opposing side wall. The illustrated embodiment includes an anchor cap **152** (which is optional). The T-bolt **50** installs on

the connector **144**, and the threaded member **54** engages the nut **58**. The joist tube **56** receives the T-cap **60** that bears against the joist bracket **66**.

It is to be appreciated that larger diameter helix members, multiple helix members, longer length shafts, or combination can be used with the anchor pier of the present invention to achieve higher load holding capacity or for use in less dense soil or ground. The anchor pier and the cap can be made of steel, plastic, or other suitable material.

FIG. **13a** illustrates in side elevational view a first alternate position of the support pier shown in FIG. **12** for supporting a lateral portion of the manufactured building. In this embodiment, the side walls **150** of the connector **144** each define a pair of space-apart openings. The joist bracket **66** attaches to the joists **26** spaced **67** from the outside face of the rim joist **26**. The ground anchor **140** installs inwardly of the side wall of the manufactured building, and further, the shaft **142** is sufficiently long to dispose the helical flights **148** below a frost line.

FIG. **13b** illustrates in side elevational view a second alternate position of the support pier **12a** for supporting the lateral portion **30** of the manufactured building **10**. In this position, the joist tube **56** is disposed in-line with the rim joist **29**. This embodiment uses the single angle member **68** for the joist bracket **66**.

FIG. **14** illustrates in elevational view an alternate application that uses a pair of the support piers **12a** with respective ground anchors **140** for supporting the lateral portion of the manufactured building **10**. The support piers **12a** are disposed in space-apart relation substantially aligned with respective opposing side edges of the side wall which define the opening **35** for the door **33**. Relatively short joist brackets **66a** may be used for distributing loading. Similarly, a plurality of the support piers **12a** may be placed under the manufactured building for perimeter load support if required.

FIG. **15** illustrates in a side elevational view an alternate embodiment of the support pier **12b**, in which the T-cap **60** received by the joist tube **56** is replaced with an adjustable connector **160** as shown in partial cut-away. The connector **160** includes a bearing member **162** and a threaded guide member **164**. The guide member **164** welds to the bearing member **162** at a perpendicular angle to a longitudinal axis of the bearing member. An adjusting member or nut **166** defines a threaded opening that engages the threaded guide member **164**. The adjusting member **166** seats at the open end of the joist tube **56**. The adjusting member **166** rotatable relative to the joist tube **56**. With the bearing member **162** in contact with the joist bracket **66**, rotating the adjusting member **166** causes the guide member **164** to move relative to the joist tube. The connector **40** discussed above connects to the ground pan **24** and engages the T-bolt **52** for connecting to the nut **58** at the lower end of the joist tube **56**.

While the embodiments discussed above provide lateral support with longitudinal movement of the joist tube **56** (and/or the adjustable connector **160**), FIG. **16** illustrates in side elevational view an alternate embodiment of the support pier **12b** for supporting the lateral portion of the manufactured building. The support pier **12b** uses the ground member discussed above (either the ground pan **24** or the ground anchor **140**) with the connector **40**, **144**. A first end of the joist tube **56** defines opposing openings. A threaded bolt **170** extending through the openings in the joist tube **56** pivotably connects the joist tube to the connector **40**, **144**. The opposing end of the joist tube **56** receives the T-cap **60** which bears against the joist bracket **66**. In one embodiment, the joist tube **56** assembles from a pair of tubes **172**, **174** that telescope

together and are secured with fasteners at a selected length; in a second embodiment, the joist tube **56** is unitary and cut-to-length during installation.

With reference to FIGS. **1** and **2**, the support pier **12** operates to support the lateral portion **30** of the manufactured building **10** proximate the opening in the side wall **32**. This is accomplished by an installer attaching the U-shaped bracket **40** to the top surface of the ground pan **24** using a nut and bolt. The installer next determines the floor joist **26** that is substantially medial of the opening in the side wall **32** for which support is to be provided with an embodiment of the support pier **12** according to the present invention. An area of ground is selected for placement of the ground pan **24**. The selected area is located under the beam support **14** and in-line with the determined medial joist **26**. It may be necessary for the installer to remove weeds and debris in the selected area to expose firm, level undisturbed soil or controlled fill. The ground pan **24** is placed on the ground **39** centered under the beam support **14** and in-line with the medial joist **26**. The ground pan **24** is firmly pressed or driven into the ground **39** so the soil surface contacts the inner surface of the top of the ground pan **24**.

The threaded T-bolt **52** is placed between the walls **42** of the bracket **40**. The bolt **48** extends through the opening in a first side wall **42**, through the tube **50** and through the opening in the opposing side wall **42**. A nut attaches to the bolt **48** and loosely tightened.

With reference to FIG. **1** and FIG. **3**, the joist bracket **66** attaches to the joists **26**. In the illustrated embodiment, the first angle member **68** and the second angle member **70** first connect together with the bolts **92** extending through the aligned openings **82**, **90** in the backs **74**, **86**. Nuts **94** received on the bolts **92** rigidly connect the angle members **68**, **70** together in back-to-back relation. The joist bracket **66** is disposed inwardly the predetermined distance **67** from the rim joist **29** and centered on the selected joist **26** that is substantially medial of the opening in the side wall **32**. In the illustrated embodiment, the joist bracket **66** is disposed inwardly about 10 inches from an outside surface of the perimeter rim joist **29**. Using a drill, pilot holes are drilled into the respective joists **26** for selected ones of the openings **76**. Lag bolts **78** or other fasteners secure the joist bracket **66** to the joists **26**.

Returning to FIG. **1**, the joist tube **56** is pivotably raised in order to measure the length of the tube to reach the joist bracket **66**. The distal end of the joist tube **56** is then cut so the length of the joist tube is 1 inch (or about) shorter than the measured length. The T-cap **60** inserts into the distal end of the joist tube **56**. The assembly pivots upwardly to position the bearing member **64** against the leg **72** and back **74** of the first angle member **68**. The concrete block pier **22** is then built on the ground pan **24**. Wood supports **25** may be necessary between the I-beam **14** and the upper blocks in the stack of blocks **27** in the pier **22**. A wrench is then used to turn the nut **58** in order to rotate the joist tube **56**. Rotating the joist tube **56** on the threaded member **54** causes the joist tube to move longitudinally towards the joist bracket **66**. This causes the bearing member **64** to bear against the leg **72** and back **74** of the joist bracket **66**. A threaded member **54** in the illustrated embodiment has a  $\frac{3}{4}$  inch diameter and length of 6 inches, which accommodates a longitudinal adjustment of about 4 inches. The nut holding the bolt **48** is then tightened firmly. The medially disposed support pier **12** supports the lateral portion **30** of the manufactured building **10**, for example, proximate the opening for the door **33** in the side wall or for supporting roof load on the side wall. The joist bracket **66** distributes the loading from the side wall through the joist

tube **56** and the ground pan to the ground. It is to be appreciated that the one support pier **12** medially disposed with the load-distributing joist bracket **66** replaces two conventional concrete block piers typically required to be installed on opposing sides of an opening (door or window) or structure requiring side wall support (i.e., a fireplace or chimney).

In an alternate embodiment (not illustrated), the joist tube **56** pivotably attaches to the joist bracket **66**, and the T-cap **60** attaches to the opposing end of the joist tube to bear forcibly against a bracket, such as an L-shaped angle member, attached to the ground pan **24**.

Yet another alternate embodiment welds the joist bracket **66** directly to the end of the joist tube **56**. With the lower end of the joist tube **56** pivotably connected to the ground pan **24** through the T-bolt **52** and the connector **44**, the support pier in this embodiment provides both tension and compression load resistance.

It is to be appreciated that side walls of the manufactured building **10** which are transverse to a longitudinal axis of the support beam **14** (or parallel to the spaced apart joists **26**) may likewise define openings requiring support. An embodiment of the support pier **12** gainfully supports the portion of the manufactured building **10** proximate the opening. This application of the present invention may use only the first angle member **68** rather than the attached first and second angle members **68**, **70** that define the joist bracket **66**. The first angle member **68** secures with fasteners **72** extending through the openings **76** to a single joist **26** transverse to the support beam **14** and spaced inwardly of the rim joist **29**. Alternatively, the first angle member **68** attaches to the rim joist. The joist bracket **66** thus attaches to one joist **26** rather than spanning across several spaced-apart joists **26** as depicted in FIGS. **2** and **3**. The ground pan **24** is positioned on a suitable area of ground medial the opening. The joist tube **50** attaches to the bracket **40** as described above. The joist tube **56** is pivotably raised in order to measure the length of the tube to reach the joist bracket **66**. The distal end of the joist tube **56** is then cut to have the joist tube about 1 inch shorter than the measured length. The T-cap **60** inserts into the distal end of the joist tube **56**. The assembly pivots upwardly to position the bearing member **64** against the leg **72** and back **74** of the first angle member **68**. A wrench is then used to turn the nut **58** in order to rotate the joist tube **56**. Rotating the joist tube **56** on the threaded member **54** causes the joist tube to move longitudinally towards the joist bracket **66**. This causes the bearing member **64** to bear against the leg **72** and back **74** of the joist bracket **66**. The installed support pier **24** provides support to the portion of the manufactured building **10** proximate the opening in the transverse side wall. If the opening in the side wall is aligned with the support beam **14**, a block pier **22** may be installed prior to causing the joist tube **56** to be extended into bearing contact with the joist bracket **66**.

FIG. **5** illustrates an alternate embodiment in which the support pier **12** uses a poured concrete pad **96** that receives an anchor head **98** having a U-shaped head **100** and a J-member **102**. The J-member **102** is embedded into the poured concrete that cures to rigidly secure the anchor head **98** to the concrete pad **96**. The U-shaped head **100** includes opposed side walls **104** and base **106**. The side walls **104** define aligned openings **108** for receiving the bolt **48** and T-bolt **52** for connecting to the joist tube **56**, as discussed above.

With reference to FIG. **7**, the support pier **12** and the joist bracket **114** support a portion of the manufactured building **10** lateral of the support beam **14**, where a side wall has an opening transverse to the floor joists **26** (or parallel to the longitudinal axis of the support beam **14**) of the manufactured building. A joist **26a** substantially medial the opening is deter-

mined. The joist bracket **110** installs with fasteners extending through the openings **116** into the selected joist **26a**. The neck portion **114** angles downwardly. The joist bracket **110** is disposed with a set-back (approximately 10 inches) from an outside face of the rim joist **29**. The ground pan **24** seats below the support beam **14** and in-line with the joist **26a**. The connector **40** attached to the ground pan **24**, connects with the T-bolt **52** to the joist tube **56**. The joist tube **56** is cut-to-length as discussed above. The joist tube **56** pivots upwardly to align the open end with the necked portion **114**. The necked portion **114** seats in the open distal end of the joist tube **56**. The joist tube **56** is moved as discussed above by rotating the nut **58** with a wrench. Rotating the nut **58** causes rotation of the joist tube **56** relative to the threaded member **54**. This causes the joist tube **56** to move longitudinally towards the joist bracket **110**. The open end of the joist tube **56** receives the necked portion **114**. Continued movement causes the joist tube **56** to bear forcibly against the joist bracket **110**. A block pier **22** may be installed as illustrated and as discussed above.

FIGS. **8-11** illustrate further applications of the support piers **12** in conjunction with foundations for manufactured buildings. FIG. **8** shows the opening in the side wall of the lateral portion **30** of the manufactured building **10** supported by the pair of support piers **12**. The joist tubes **56** extend to intermediate portions of the joists between the edges of the side wall that define the opening. FIG. **9** shows the joist tubes extending at angles to the edges of the side wall that define the opening. FIGS. **10** and **11** illustrate the support piers **12** used together with foundation systems for manufactured buildings.

With reference to FIG. **12**, the support pier **12a** operates with the ground anchor **140** providing compression or downward load support to perimeter portions of the manufactured building **10**. The anchor pier **140** is positioned in alignment with a medial joist **26** relative to the opening **35** or a selected joist **26** for positioning the support pier **12a** relative to other support piers in accordance with the requirements of the manufacturer of the building. The anchor pier **140** is driven into the ground. This is accomplished with a power driver or lever for rotating the shaft **142** to drive the tip **146** into the ground with the helical flights **148**. For sites susceptible to ground freezing, the helical flights **148** should be driven below the frost line **149** of the ground **39**.

The joist bracket **66** attaches with fasteners to the joist **26**. The T-bolt **52** attaches to the connector **144** and the threaded member **54** engages the nut **58**. The joist tube **56** receives the T-cap **60** and then pivots into alignment with the joist bracket **66**. A wrench is used to rotate the nut **58** and cause the joist tube **56** to move longitudinally as the nut moves on the threaded member **54**. This moves the joist tube **56** into forcing contact with the joist bracket **66**. The support pier **12a** then transfers loading from the manufactured building to the ground. An embodiment in which the joist bracket **66** is welded to the joist tube **56** resists compression and tension load forces.

FIG. **13a** illustrates the support pier **12a** spaced inwardly a predetermined distance from the exterior face of the rim joist **29**. FIG. **13b** illustrates the support pier **12a** aligned with the rim joist **29**.

FIG. **14** illustrates a pair of the support piers **12a** with the ground anchors **140** for supporting the lateral portion of the manufactured building. The support piers **12a** are disposed in space-apart relation substantially aligned with respective opposing side edges of side wall which define the opening **35** for the door **33**. Similarly, a plurality of the support piers **12a** may be placed under the manufactured building for load support if required.

The alternate embodiment of the support pier **12b** illustrated in FIG. **15** permits longitudinal bearing adjustment at both the lower and upper ends of the joist tube **56**. As discussed above with respect to FIG. **1**, the joist tube **56** pivotably connects with the T-bolt **52** and nut **58** to the connector **44** on the ground pan **24**. Rather than receive the T-cap **60**, the upper end of the joist tube receives the connector **160**. The joist tube **56** pivots to dispose the bearing member **162** proximate the joist bracket **66**. The nut **58** is rotated with a wrench to move the joist tube **56** towards the joist bracket **66** and push the bearing member **162** into contact with the joist bracket. In this embodiment, additional bearing force may be applied to push the bearing member into bearing contact with the joist bracket **66**. This is accomplished by using the wrench to turn the adjusting member **166** relative to the joist tube **56**. With the bearing member **162** in contact with the joist bracket **66**, rotating the adjusting member **166** causes the guide member **164** to move longitudinally relative to the adjusting member **166** and joist tube **56**. The threaded guide member **164** moves to drive the bearing member **162** forcibly into contact with the joist bracket **66**.

While the embodiments discussed above provide lateral support with longitudinal movement of the joist tube **56** (and/or the adjustable connector **160**), FIG. **16** illustrates in side elevational view the alternate embodiment of the support pier **12b** for supporting the lateral portion of the manufactured building. In use, the ground pan **24** with connector **40** or the ground anchor **140** is installed as discussed above. The joist bracket **66** is also installed as discussed above. The joist tube **56** pivotably connects to the connector with a bolt that extends through the aligned openings in the side wall of the connector and the openings in the lower end of the joist tube **56**. A nut secures the bolt to the connector **40**, **140**. In a first embodiment, the joist tube **56** assembles with the telescoping tubes **172**, **174**. For example, the tube **172** has a 1 and ¼ inch diameter and the tube **174** has a 1 and ½ inch diameter. The joist tube **56** pivots to orient towards the joist bracket **66**. The tubes **172**, **174** telescope apart to extend the free distal end into contact with the joist bracket. The free end may receive the T-cap **60** for bearing contact with the joist bracket **66**. When positioned, the telescoped tubes **172**, **174** are secured together with fasteners.

In the second embodiment, the distance between the connection of the joist tube to the connector and the joist bracket is measured, and a distal portion cut-off. The joist tube receives the T-cap **60** or other bearing member. The manufactured building is raised slightly (for example, using a screw jack or inflatable jack or the like). The joist tube **56** is pivotably moved to be diagonal between the ground member and the joist bracket **66**. The jack is lowered to move the manufactured building into bearing contact with the T-cap **60** or other bearing member.

The present invention accordingly provides the support pier for the lateral portion of a manufactured building proximate a side wall that has an opening, that experiences increased structural loading (such as from a chimney or fireplace) or the manufactured building is located at a site that experiences increased roof loading (such as snow), with the joist tube attached to a ground pan at one end and an opposing end that bears against the joist bracket proximate the lateral portion of the building requiring pier support. The ground support member disposed on the ground laterally and inwardly of the outside face of the side wall **32** of the manufactured building, positions the ground support away from ground most susceptible to water saturation and thus less susceptible to ground heave or movement caused by freezing and thawing weather conditions. The embodiment using the

ground anchor as the ground support member aligned with the side wall of the manufactured building disposes the helical flights below the frost line. While this invention has been described in detail with particular references to illustrated embodiments thereof, it should be understood that many modifications, additions and deletions, in additions to those expressly recited, may be made thereto without departure from the spirit and scope of the invention.

What is claimed is:

**1.** A support apparatus for supporting a lateral portion of a manufactured building having a support beam extending longitudinally in a first direction and having a plurality of spaced-apart floor joists disposed transverse to the support beam extending in a second direction to a lateral edge of the manufactured building, comprising:

a ground member for being received on a ground surface beneath a support beam of a manufactured building having a portion lateral of the support beam;

a joist bracket for being attached to at least one joist proximate the lateral edge in the lateral portion of the manufactured building;

a joist tube for being disposed transverse to the support beam and extending in the second direction and a first end bearing against the ground member;

a connector for pivotably connecting the first end of the joist tube to the ground member;

a cap member disposed at a second end of the joist tube for bearing against the joist bracket; and

a mover assembly for being operatively engaged to the joist tube for moving the joist tube longitudinally from a first position to a second position,

whereby the joist tube being moved longitudinally to the second position by operating the mover assembly bears against the joist bracket and the ground member for transferring a load from the lateral portion of the manufactured building to the ground and thereby supporting the lateral portion of the manufactured building.

**2.** The support apparatus as recited in claim **1**, wherein the cap member comprises:

a base member that matingly engages the joist tube at the second end; and

a bearing member rigidly attached to the base member for bearing against the joist bracket.

**3.** The support apparatus as recited in claim **2**, wherein the bearing member comprises a rod having a longitudinal axis transverse to a longitudinal axis of the base member.

**4.** The support apparatus as recited in claim **2**, wherein the second end of the joist tube is open and the base member is received therein.

**5.** The support apparatus as recited in claim **1**, wherein: the joist tube comprises an open ended elongated tube; and the mover assembly comprises:

a rotation member disposed at the first end of the joist tube and defining a threaded opening coaxial with the tube; and

a threaded connector for threadably connecting to the rotation member, the threaded connector pivotably connected to the ground member.

**6.** The support apparatus as recited in claim **5**, further comprising:

a U-shaped bracket having opposing legs and a base that rigidly connects to the ground member and the legs defining aligned opposing openings;

an axle mounted between the opposing legs for pivotable positioning thereof relative to the ground member; and the threaded connector attached to the axle and extending therefrom.

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7. The support apparatus as recited in claim 6, wherein the axle comprises a threaded bolt having a nut for securing the bolt in the opposing openings of the U-shaped bracket.

8. The support apparatus as recited in claim 1, wherein the joist bracket comprises an angle member that defines a plurality of openings for receiving fasteners therethrough for attaching the joist bracket to a joist of the manufactured building.

9. The support member as recited in claim 1, wherein the joist bracket comprises a first angle member and a second angle member, each having a leg and a back, the backs each defining at least a pair of openings for receiving fasteners so that the first angle member and the second angle member join together back-to-back therewith, the leg members each defining spaced-apart plurality of openings for receiving second fasteners for attaching the joist bracket to at least one joist of the manufactured building.

10. The support member as recited in claim 1, further comprising a plurality of blocks stacked on the ground member to support the support beam.

11. The support member as recited in claim 1, wherein the ground member comprises a ground pan having a planar base and at least a pair of opposing sides extending in a first direction substantially perpendicular to the base for being embedded in the ground.

12. The support member as recited in claim 1, wherein the ground member comprises a ground anchor having an elongated shaft with at least one helical flight disposed proximate a first end and the connector attached to an opposing end of the elongated shaft for pivotably engaging the joist tube.

13. The support apparatus as recited in claim 5, wherein the connector further comprises:

a U-shaped bracket having opposing legs and a base that rigidly connects to the elongated shaft and the legs define aligned opposing openings;

a tube mounted between the opposing legs for pivotable positioning thereof relative to the ground member; and the threaded connector attached to the tube and extending therefrom for connecting to the rotation member.

14. The support apparatus as recited in claim 13, wherein the tube comprises a threaded bolt having a nut for securing the bolt in the opposing openings of the U-shaped bracket.

15. The support apparatus as recited in claim 1, further comprising a second mover assembly operatively disposed between the second end of the joist tube and the cap member for moving the cap member from a first position to a second position bearing forcibly against the joist bracket.

16. The support apparatus as recited in claim 15, wherein the second mover assembly comprises:

a rotation member disposed between the joist tube and the cap member and defining a threaded opening coaxial with the joist tube; and

a threaded member for threadably engaging the rotation member, the threaded member connected to the cap member.

17. A method for supporting a lateral portion of a manufactured building having a support beam extending longitudinally in a first direction and having a plurality of spaced-apart floor joists disposed transverse to the support beam extending in a second direction to a lateral edge of the manufactured building, comprising the steps of:

(a) positioning a ground member on a ground surface below a support beam of a manufactured building;

(b) attaching a joist bracket to at least one joist proximate the lateral edge in the lateral portion of the manufactured building; and

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(c) disposing a joist tube transverse to the support beam and extending in the second direction with a first end in bearing contact with the ground member and a second end bearing on the joist bracket;

(d) longitudinally moving the joist tube from a first position with the second end of the joist tube spaced from the joist bracket to a second position bearing against the joist bracket,

whereby the joist tube bears forcibly against the joist bracket and the ground member for transferring a load from the lateral portion of the manufactured building to the ground and thereby support the lateral portion of the manufactured building.

18. The method as recited in claim 17, wherein longitudinally moving the joist tube comprises rotating a nut on a threaded member pivotably attached to a connector of the ground member, the nut contacting the joist tube which moves in response to rotating the nut.

19. The method as recited in claim 17, further comprising the step of inserting a cap member in an open distal end of the joist tube for contactingly bearing against the joist bracket.

20. The method as recited in claim 19, further comprising the step of assembling the cap member by rigidly attaching a bearing member to a base member that is received in the distal end of the joist tube.

21. The method as recited in claim 17, further comprising assembling the joist bracket by connecting a first angle member and a second angle member together, each angle member having a leg and a back, the backs each defining at least a pair of openings for receiving fasteners so that the first angle member and the second angle member join together back-to-back therewith, the leg members each defining spaced-apart plurality of openings for receiving second fasteners for attaching the joist bracket to at least one joist of the manufactured building.

22. The method as recited in claim 17, wherein the ground member is disposed under a support beam of the manufactured building aligned with a floor joist that is substantially medial an opening in a side wall to distribute the loading of the building to the outside edges of the opening.

23. The method as recited in claim 17, wherein the joist bracket attaches to the floor joist spaced inwardly of an outward side of a perimeter rim joist.

24. The method as recited in claim 19, further comprising the step of moving the cap member at one end of the joist tube from a first position to a second position forcibly bearing against the joist bracket.

25. The method as recited in claim 17, wherein step (a) positioning the ground member comprises the ground member comprising ground pan with at least two opposing perimeter walls extending substantially perpendicularly in a first direction which perimeter walls are pushed into the ground.

26. The method as recited in claim 17, wherein step (a) positioning the ground member comprises rotating a shaft having at least one helical flight into the ground.

27. The support apparatus as recited in claim 1, wherein: the joist tube further comprises a rotation member at a first end thereof; and the connector comprises:

a U-shaped bracket having opposing legs and a base that rigidly connects to the elongated shaft and the legs define aligned opposing openings;

a tube mounted between the opposing legs for pivotable positioning thereof relative to the ground member; and

a threaded connector attached to the tube and extending therefrom for threadably connecting to the rotation

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member for longitudinal movement of the joist tube between the first position and the second position for bearing against the joist bracket.

28. The support apparatus as recited in claim 1, wherein the mover assembly comprises:

a rotation member disposed between the joist tube and the cap member and defining a threaded opening coaxial with the joist tube; and

a threaded member for threadably engaging the rotation member, the threaded member connected to the cap member.

29. The support apparatus as recited in claim 1, wherein the joist bracket comprises a plate having a base portion defining a plurality of openings and a neck portion extending at an angle from the base portion, the neck portion for being received in the second end of the joist tube, whereby fasteners being extended through the openings, secures the plate to the joist.

30. A support apparatus for supporting a lateral portion of a manufactured building having a support beam extending longitudinally in a first direction and having a plurality of spaced-apart floor joists disposed transverse to the support beam extending in a second direction to a lateral edge of the manufactured building, comprising:

a ground member for being received on a ground surface beneath a support beam of a manufactured building having a portion lateral of the support beam;

a joist bracket for being attached to at least one joist proximate the lateral edge in the lateral portion of the manufactured building, the joist bracket comprising a first

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angle member and a second angle member, each of the first and second angle members having a leg and a back, the backs each defining at least a pair of openings for receiving fasteners so that the first angle member and the second angle member join together back-to-back therewith, the leg members each defining spaced-apart plurality of openings for receiving second fasteners for attaching the joist bracket to at least one joist of the manufactured building;

a joist tube for being disposed transverse to the support beam and extending in the second direction and a first end bearing against the ground member and a second end bearing on the joist bracket; and

a mover assembly for being operatively engaged to the joist tube for moving the joist tube longitudinally from a first position to a second position,

whereby the joist tube being moved longitudinally to the second position by operating the mover assembly bears against the joist bracket and the ground member for transferring a load from the lateral portion of the manufactured building to the ground and thereby supporting the lateral portion of the manufactured building.

31. The support apparatus as recited in claim 30, further comprising:

a connector for pivotably connecting the first end of the joist tube to the ground member; and

a cap member disposed at the second end of the joist tube for bearing against the joist bracket.

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